Penn Engineering
ONLINE LEARNING

# CIT 591 Introduction to Software Development

### Module 2: Loops and Conditionals

## Module Learning Objectives

- Use loops to avoid copy-pasting code for repeated actions
- Perform Monte Carlo simulations to estimate probabilities
- Trace code with many nested conditionals and loops

## Module Glossary

- **&&** : boolean operator AND
- **||** : boolean operator OR
- **!** : boolean operator NOT
- **Boolean:** boolean is a datatype. A boolean variable is a variable that is only allowed the value True or False.
- **Conditional:** A conditional statement of code is a statement that may or may not be executed depending upon whether the controlling condition evaluates to true or false. In most programming languages, these can be recognized with the keyword **if**.
- **Loop:** A programming construct that allows a block of code to be performed repeatedly.
- **Scope:** The set of lines of code where a variable can be accessed or used. A variable is scoped to the block of code that it is defined in.

## Module Resources

- **Textbook Readings:**
  - Booleans & Conditionals:
    - 5.1: The if Statement
    - 5.2: Comparing Values
    - 5.3: Multiple Alternatives
    - 5.7: Boolean Variables and Operators
  - Loops:
    - 6.1: The while Loop
    - 6.3: The for Loop
  - Scope:
    - 3.6: Local Variables
  - Good Supplemental on Loops

    - 6.7 Common Loop Algorithms

- **Websites:**
    - Java Development Kit (JDK) Website
    - Download Eclipse (IDE for Java)
    - Strings (Java Documentation)
    - CodingBat exercises for optional extra practice

## Key Concepts & Examples

**Booleans and Conditionals:** Combining boolean variables with conditional statements (*if x, do y*) allows you to make your programs do different things under different situations. This gets our programs closer to modeling real world problems.

- Examples referenced in lecture video: We wrote a method called `checkFull` to see if our gas tank was full or not. We set the method to return a boolean, true or false.
- We also wrote `if` conditions to check if two people's names had the same initials, and if someone was North American, depending on what country they are from (including allowing for someone to be from multiple countries!).

**While Loop:** A way of repeating a block of code "while" some condition applies, or until some condition is satisfied. While loops are the best option when you don't know how many times the code will run, such as when a user is inputting data.

- Example referenced in lecture video: making the car beep 3 times, reading numbers from the console and adding them up.

**For Loop:** Another way of repeating a block of code in which an index variable is initialized (provided with a starting value) and incremented by a certain amount for a specified number of times. You can use while loops and for loops to do the same thing, but the general rule of thumb is that if you know that your loop is going to run a definite number of times, use a for loop.

- Examples referenced in lecture video: A more concise way to make the car beep 3 times; printing numbers from 1 to 100.

**Scope of Variables:** To understand the scope of a variable, we just need to remember Java's main rule - a variable is scoped to the block of code that it is defined in. For example, a for loop variable is scoped to the entire loop.

- Examples referenced in lecture video: Finding the current gas level of a car; the effects of changing a variable name inside and outside of a loop.

**Intro to Assignment 2, Simulations:** Using loops, computers can be used to simulate random events and calculate their probability

- Example referenced in lecture video: rolling dice, tossing coins